# AMENDMENT TO THE SPECIFICATION

*Please replace the following paragraph on page 6 line 16 through page 7 line 5 with the following:*

Referring to Figure 1, a saccadic eye movement detection and analysis system 10 includes a light source 12, an optical system with lens, 14; light sensor 16 comprised of a photosensitive array 18; and a data processor 20. The system 10 is configured to detect and analyze saccadic motion of the eye 22. The lens 14 and the light sensor 16 are mounted to housing 17, depicted here via a black rectangle. The light source 12 can also be mounted to housing 17. The system 10 uses optical navigation chip technology to determine eye position and motion. The sensor 16 can be connected to the processor 20 for data transmittal, which can be achieved via a universal serial bus (USB) wire or other communications connection, such as 802.11 wireless networks. The processor 20 can be any of a variety of devices, including a laptop computer or a personal data assistant (PDA), as depicted. The system 10 ~~is~~ preferably can be of a size and weight that is readily portable, which for example could be handheld. Depending on features the system 10 could weigh less than about 1 to 2 pounds, and have dimensions of about 1 x 3 x 9 inches so that it approximates the size of extant ophthalmoscopes. The light source 12 can be outside the spectrum visible to humans. CCDs can "see" in the near infrared, which is the basis for television remote controls. The light source 12 can be ambient, or a light bulb, or other devices; but, a light emitting diode (LED) has the advantage of a wide variety of intensities and wavelengths. This makes it possible to illuminate the subject's eye in the near-infrared and outside the visible spectrum.

*Please replace the following paragraph on page 11 line 28 through page 12 line 23 with the following:*

At step 35, saccadic performance can be scored against previous measures of the same subject, or, saccadic performance can be scored against previous measures of the another subject, or, saccadic performance can be scored against previous measures of the others subjects in aggregate form using population statistics, where the comparison subject or group can be a population of normal or abnormal subjects, where the abnormal subjects are representative of know disorders, diseases, conditions, or variants. The processor 20 uses the information obtained from light sensor 16 regarding eye movement parameters, to calculate or otherwise determine, by for example, using a lookup table or a polynomial curve fit that maps saccadic performance parameters to a known database. The processor can determine various parameters such as velocity, maximum velocity, acceleration, latency, etc. associated with the eye movement. Processor 20 can categorize and where appropriate can quantify conditions associated with the subject's eye movement parameters. The processor 20 can relate the determine parameters to known relationships between parameters and conditions in an attempt to categorize the condition associated with the subject's movement parameters, choosing among various abnormal states, such as, anesthetized, intoxicated, fatigued, delirious, manic, attention deficit, etc. If the exact condition is indeterminate, a "rule-out" list can be formulated to suggest avenues of further investigation. The processor 20 can also help quantify conditions, heavily sedated versus lightly sedated, or is the anesthesia "on board" now sufficient for the planned procedure, or is the subject "legally" intoxicated, etc. The processor 20 can inform the examiner using various

modalities, such as lights or displays (LCDs), monitors or indicators or enunciators including audible indicators using tones, beeps, chimes, or bells, etc., that can indicate the subject's condition and other information to an operator of the system 10. For example, the processor 20 may indicate that the subject's condition is normal, impaired, anesthetized, intoxicated, fatigued, delirious, manic, attention deficit, depressed, or manic. The impaired condition can be caused by one or more substances such as benzodiazepines, ethanol (alcohol), narcotics including heroine and cocaine, barbiturates, and amphetamines including "crystal-meth." Although presently in many cases, the system cannot identify the exact substance present, it can determine whether a stimulant, such as amphetamine, or a depressant such as alcohol is present; but, in the case of opiates, overly-constricted pupils is quite specific for opiate use/abuse. As the technology advances, the system may be able to determine the exact substance present in most cases.

## ARGUMENTS AGAINST REJECTION OF CLAIMS 1-16 UNDER 35 USC §112

The applicant acknowledges the error in the claim construction wherein each claim was ended with a semi-colon rather than the appropriate period. The Claims have been amended to address this issue.

Additionally, Claims 1-14 have been amended to remove the inconsistent language noted by the Examiner. Likewise, Claim 10 and Claim 11 have been amended to address the antecedent basis problem.

Claim 15 has been amended to clarify an indication of eye motion over a discrete interval of time.

## ARGUMENT AGAINST REJECTION OF CLAIMS 1-13, 15 AND 16 UNDER DOUBLE PATENTING

The applicant is filing, contemporaneously with the arguments and amendments, a terminal disclaimer as required by 37 CFR 1.321(c) and the payment of the fee required by 37 CFR 1.20(d) which is calculated to be $65 and is included herewith.

## ARGUMENT AGAINST REJECTION OF CLAIMS UNDER 35 USC §102(b)

Claims 1-4, 12 and 15 as anticipated by Cornsweet, et al (US Patent No. 5,410,376)

The Examiner rejected Claims 1-4, 12 and 15 as anticipated by Cornsweet, et al (US Patent No. 5,410,376 )("Cornsweet"). According to the the Office Action Cornsweet teaches in Fig. 1 a saccadic-motion detection device comprising an optical system (16, 20, 21, 24, 22) for focusing light reflected or emitted from a subject's eye (10) onto an optical navigation chip (23, 25). The Applicant respectfully disagrees that

an optical navigation chip taught by the present invention is expressly or inherently the same as taught in Cornsweet.

Regarding the Claim 1 rejection, Cornsweet teaches that the light reflected or emitted from a subject's eye (10) is sent through a beam splitter (22) then separately to a CCD video camera (25) and a quadrant detector (23). Neither the CCD video camera nor the quadrant detector is similar in form, method, or function to the optical navigation chip of claim 1 in the present invention.

The CCD video camera (25), Cornsweet, in column 1, lines 57-67 distinguishes between "ordinary video rates" and "special video systems having… high enough sample rates" and precludes the use of a special video system as incompatible due to expense and high heat. Therefore the CCD video camera must be of the ordinary kind. An ordinary CCD video camera is a device that contains an array of 100,000 to 1,000,000 charge coupled device elements upon which a real image is formed. The camera encodes this image into sequential video frames at the rate of 30 per second or fields at the rate of 60 per second and transmits this information electrically. The optical navigation chip of claim 1 is described in the present invention on page 7, line 14 through page 9, line 11. In the preferred embodiment the optical navigation chip is an electronic integrated circuit known as an Optical Mouse Sensor. A specific example of such an Optical Mouse Sensor is the model ADNS-2620 made by Agilent Technologies™ of Palo Alto, CA. The only common characteristics of the optical navigation chip and the CCD video camera are that they both utilize an image and they both contain CCD's. The disparate characteristics are numerous:

- The design purpose of a CCD video camera is to transmit a complete representation of an image. Conversely the design purpose of the optical navigation chip is to quantify only the motion of an image and transmit the magnitude of that motion numerically to a processor.
- The CCD video camera has a CCD array which typically contains 100,000 up to 1,000,000 pixel elements. Conversely, the optical navigation chip has a CCD array with 256 up to 400 pixel elements.
- The CCD video camera can generate image data at 30 frames per second. Conversely, the optical navigation chip can generate motion data at rates between 1200 and 6000 frames per second.
- Most significantly, the CCD video camera cannot participate in the task of saccadic motion detection. The image data would require complex processing to produce the required motion data. A common CCD video camera provides far too slow frame rates. A special high speed camera would be highly expensive and require too intense a light source. Conversely, the optical navigation chip is expressly designed to deliver image motion data to a computer. The optical navigation chip generates raw motion data as a native function. The optical navigation chip provides frame rates ten times as fast as an expensive high speed camera. The optical navigation chip is very inexpensive due to high volume of production.

Finally, Cornsweet, in column 3, lines 34-42 and column 3, lines 62-63, states that the CCD video camera is used for making pupil diameter measurements, not for tracking eye movement.

The quadrant detector (23) taught by Cornsweet, is one element of an electromechanical servo loop. See Cornsweet column 5, lines 51-66. This is a closed loop feedback system in which the quadrant detector is comprised of four infrared detectors. See Cornsweet Fig. 1A and column 1, lines 62 – 68. An image of the

pupil is centered on the four quadrants in such a way as to balance the light of the image equally between the top and bottom halves of the quadrant detector as well as to balance the light of the image equally between the left and right halves of the quadrant detector. See Cornsweet column 5, lines 4-14. The signals from the infrared detectors are electronically compared to generate horizontal and vertical error signals that are proportional to the horizontal and vertical shift of the pupil image from the center of the quadrant detector. These error signals are amplified and digitized to drive stepper motors that control the horizontal and vertical position of tracking mirror (16) of Fig. 1. The tracking mirror is located in the optical path in such a way that deflection of the tracking mirror causes a shift of the pupil image on the quadrant detector. The polarity of the error signals is such that the motion of the tracking mirror counteracts eye motion so that the pupil image remains centered on the quadrant detector. See Cornsweet column 5 lines 51-55. As a result, mirror motion is directly proportional to eye motion and therefore the digitized position signals generated to drive the motors also represent position, and therefore motion of the eye.

The description of the quadrant detector bears no resemblance to the description of the optical navigation chip of claim 1. See page 7, line 14 through page 9, line 11 of the present invention. The quadrant detector is assembled of four infrared detectors on which an image of the pupil is centered by an electromechanical feedback servo loop. Conversely, the optical navigation chip inherently contains a CCD array of from 256 to 400 elements on which an image of the surface of the eye freely moves. The quadrant detector produces analog horizontal and vertical error signals for the purpose of driving servomotors. Conversely, the optical navigation chip generates x and y motion data as a native function.

The quadrant detector is only one element of a somewhat complex electromechanical tracking servo loop which also includes stepper motors; a tracking mirror; an analog error signal generating system comprised of 12 resistors, 3 amplifiers, and an analog to digital converter; a stepper driver system comprised of a CPU and two stepper controllers, considerable software to generate stepper signals from the error signals. See Cornsweet Figures 5, 6 and 8c. Furthermore this tracking servo loop requires careful management of feedback loop gain in order to maintain stability. See Cornsweet column 5, line 66 – column 6, line 30. All of these elements of the entire tracking servo loop must be in place in order to calculate the x and y values of saccadic motion. Conversely, the optical navigation chip generates x and y motion data as a native function.

Additionally, the optical systems of the present invention, and Cornsweet are fundamentally different in that each creates different images for different purposes. In Cornsweet the optical system must create two images of the pupil of the eye, direct illumination from the IRLED (17), and participate in the tracking servo loop. As a result it includes a motor controlled tracking mirror as well as two beam splitters. Conversely, in the present invention, the optical system in claim 1 is only required to create a real image of the surface of the eye on the CCD of the optical navigation chip.

According to MPEP §2131 a " 'claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.' *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)." More importantly in MPEP § 2131.02 '[T]the identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co*., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Thus, given the above arguments it is clear that Cornsweet does not anticipate each and every element as set forth in the Claim 1 of the present invention and thus the 102(b) rejection has been overcome. Accordingly, the dependent claims 2-4 are allowable for the same reason. Nonetheless, distinguishing arguments for claims 2 - 4 are given below.

Regarding the Claim 2 rejection, Cornsweet in Column 4 line 5 refers to digitization of the error signals which result from combining the analog signals corresponding to the amount of IR light falling on the infrared detectors of the of the quadrant detector. These error signals represent the complex interaction of the eye motion, the stepper motor motion and the tracking mirror motion. These error signals do not represent the motion or position of the eye as stated in claim 2. Cornsweet in Column 5, lines 25-33 actually discusses the generation of the vertical axis (X) displacement and horizontal (Y) axis displacement of the tracking mirror. Claim 2 of the present invention, on the other hand, specifies that the generation of representations of movement or position is accomplished directly by the optical navigation chip. This is completely different to the generation of x and y values by way of tracking mirror displacement as stated in Cornsweet.

Regarding the Claim 3 rejection, Cornsweet in Column 1, lines 54-68 states that saccades are quick, requiring high speed sampling. Cornsweet further states an inability of ordinary video to accomplish the necessary sample rates, and the impracticality of using high speed video for tracking. Cornsweet then states the desirability of using a "photodetector" which may be sampled at high rates. "Photodetector" as understood from the context of the Cornsweet specification refers to a set of infrared detectors arranged as a "quadrant detector" as described in detail above. Claim 3 makes no claim regarding that style of "photodetector." "Photodetector" understood more generally would be any device sensitive to light. Taken in such a general sense, the statement in column 1 lines 64 and 65, that "it is desirable to sense eye positions with a photodetector that may be sampled at very high rates" is merely an obvious statement of the task. Claim 3, as amended, of the present invention teaches that the saccadic motion detection device of Claim 1, containing the optical navigation chip, can be configured to determine the rate of movement of the eye.

Regarding the Claim 4 rejection, as currently amended Claim 4 of the present invention, claims that the saccadic motion detection device of Claim 1, containing the optical navigation chip, can be configured to

determine the angular position, speed, and acceleration of the eye. Cornsweet in Column 1, lines 47-64, discusses the challenges of the high speed of saccades, and the importance that a proposed device be fast enough to capture the high-speed motion of saccades. Such points are not informative, but are obvious to the task of tracking saccadic motion and thus do not read explicitly or inherently on the present Claim 4. Cornsweet in Column 3, lines 47-58, discusses the relatively slow "pursuit motion" of the eye, explains the particular effect of this slow motion on specific aspects of its tracking servo loop system, and states that the Cornsweet invention can employ the CCD video camera to compensate for such effects. In the present invention, Claim 4, as amended, claims that the saccadic motion detection device of Claim 1, containing the optical navigation chip, can be configured to determine the angular position, speed, and acceleration of the eye. This claim does not specify any limitation with regard to "pursuit motion". Cornsweet in Column 5, lines 25-40 discusses the generation of the vertical axis (X) displacement and horizontal (Y) axis displacement of the tracking mirror. These x and y values do not specify angular position, speed, or acceleration as is claimed in the present invention in Claim 4.

Regarding the Claim 12 rejection, Claim 12 has been consolidated with Claim 11 and thus has not been anticipated by Cornsweet.

Regarding the Claim 15 rejection, the Examiner equates the motion transducer to the optical navigation chip based on the assertion that both contain photoelectric cells. This suggests a premise that all devices that contain photoelectric cells are equivalent. The same premise is suggested in the previous rejection of claim 1. The Applicant respectfully disagrees with that premise. As pointed out in the arguments to the Claim 1 rejections, dissimilar devices of clearly distinguishing characteristics and widely diverse function may utilize photoelectric cells in some aspect of their operation. As such these devices may be applied in a variety of unique ways that are wholly unrelated one to another. Accordingly Cornsweet does not anticipate Claim 15

<u>Claims 1-7, 10, 12, 15 and 16 as anticipated by Rothberg, et al (US Patent No. 5,422,690)</u>

The Examiner rejected Claims 1-7, 10, 12, 15 and 16 as anticipated by Rothberg, et al (US Patent No. 5,422,690)("Rothberg"). Regarding the Claim 1 rejection, as the Examiner noted Figure 6 in Rothberg is the same as Figure 1 in Cornsweet with the exception of the numerals being different. Thus, the amendments and arguments to Claim 1 made for Cornsweet apply equally to the rejection based on Claim 1 under Rothberg.

According to MPEP §2131 a " 'claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.' *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)." More importantly in MPEP § 2131.02 '[T]the identical invention must be shown in as complete detail as is contained in the ...

claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Thus, given the above arguments it is clear that Rothberg does not anticipate each and every element as set forth in the Claim 1 of the present invention and thus the 102(b) rejection has been overcome. Accordingly, the dependent claims 2-14 are allowable for the same reason. Nonetheless, distinguishing arguments for claims 2 - 7, 10 and 12 are given below.

Regarding the Claim 2 rejection, Rothberg in Column 8 lines 50-61 refers to digitization of the error signals which result from combining the analog signals corresponding to the amount of IR light falling on the infrared detectors of the of the quadrant detector. These error signals represent the complex interaction of the eye motion, the stepper motor motion and the tracking mirror motion. These error signals do not represent the motion or position of the eye as stated in claim 2 of the present invention.

Regarding the Claim 3 rejection, Rothberg in Column 8, lines 31-49, discusses the relatively slow "pursuit motion" of the eye, explains the particular effect of this slow motion on specific aspects of the tracking servo loop system, and states that one can employ the CCD video camera to compensate for such effects. In the present invention, Claim 3, as amended, claims that the saccadic motion detection device of Claim 1, containing the optical navigation chip, can be configured to determine the rate of movement of the eye. This claim does not specify any limitation with regard to "pursuit motion," and the saccadic motion detection device bears no similarity to the Rothberg device.

Regarding the Claim 4 rejection, Claim 4, as amended in the present invention, claims that the saccadic motion detection device of Claim 1, containing the optical navigation chip, can be configured to determine the angular position, speed, and acceleration of the eye. Rothberg in Column 4, lines 25-44 does not mention angular position or acceleration of the eye, but does mention "Saccadic Velocity." Additionally, Rothberg in Column 8, lines 31-49, discusses the relatively slow "pursuit motion" of the eye, explains the particular effect of this slow motion on specific aspects of the tracking servo loop system, and states that the Rothberg invention can employ the CCD video camera to compensate for such effects. Claim 4, as amended in the present invention, claims that the saccadic motion detection device of Claim 1, containing the optical navigation chip, can be configured to determine the angular position, speed, and acceleration of the eye. This claim does not specify any limitation with regard to "pursuit motion," and the saccadic motion detection device bears no similarity to the Rothberg device.

Regarding the Claim 5-7 rejections, each of these claims is a dependent claim of Claim 1. Applicant has already provided an argument that Claim 1 is patentably distinct over Rothberg and thus Claims 5-7 are allowable for the same reason.

Regarding the Claim 10 rejection, Claim 10 as amended in the present invention, clearly states that the saccadic-motion detection device of claim 1 can be grasped by hand. Rothberg in Column 2, lines 62-65 teaches a device that remains as large as a catalog case and large enough to be appropriately supported by a table. The complex optics and the particularly complex tracking servo loop system with two motors and other attendant components further indicate this large size. Conversely, claim 10 of the present invention, as further demonstrated in Fig 2, describes a saccadic motion detection device that is comfortably held by the handle of the mechanical frame in one hand. This small size is achievable due to the novel application of the optical navigation chip that, in the preferred embodiment, is as small as an electronic integrated circuit dual in line package. The small electronic integrated circuit is in marked contrast to the Rothberg tracking servo loop system.

Regarding the Claim 12 rejection, Claim 12 has been consolidated with Claim 11 and thus has not been anticipated by Cornsweet.

Regarding the Claim 15 rejection, the arguments presented regarding claim 15 under Cornsweet apply here as well.

Regarding the Claim 16 rejection, the arguments above regarding Claim 10 are applicable to the rejection of Claim 16 as well.

<u>Claims 1 and 13 as anticipated by Smith, Robert F. (US Patent No. 6,666,857)</u>

The Examiner rejected Claims 1 and 13 as anticipated by Smith, Robert F. (US Patent No. <u>6,666,857</u>)("Smith"). Regarding the Claim 1 rejection, Claim 1, as amended in the present invention, states: A saccadic motion detection device comprised of an optical system for focusing light reflected or emitted from a subject's eye onto an optical navigation chip.

Smith presents a system that precisely controls the application of a pulsed excimer laser to perform transepithelial ablation of the cornea in photorefractive keratectomy (PRK) procedures. See column 3 lines 37 – 51. The precision is accomplished through the use of two detection and control subsystems. One subsystem performs wavefront analysis to produce a target corneal topography that is then compared against the continuously monitored corneal topography changes during ablation. The second subsystem performs eye tracking that adjusts the ablative laser beam to compensate for eye movement during the procedure. See column 2 lines 63-67. Only the elements of the eye tracking subsystem are relevant to the the present invention.

With regard to Smith's Fig. 1, only items 20, 201, 9, 13, and 18 are involved in the detection of eye motion. All other elements, including 14, 17, 16, and 19, perform functions of other subsystems not directly related

to detection of eye motion. The eye tracking system requires the application of an annular mask (20) which is attached to the sclera of the eye by means of small projections (201). See column 7 lines 43 – 54, column 12 lines 34 – 49, and Fig. 4a. The mask contains reference markings that are necessary for the operation of the segmented charge coupled device, SCCD (18). See column 5 lines 45-52. SCCD (18) is constructed by a series of linear charge coupled devices (LCCDs). See column 12 lines 49 – 55. An image of the mask reference markings is imaged onto the SCCD such that the reference markings are aligned onto the corresponding LCCDs. Eye position is detected by detecting the intensity maxima induced onto the LCCDs by the image of the reference marks.

The SCCD bears no similarity to the optical navigation chip of claim 1 of the present invention. The SCCD is assembled of six linear CCD's each about 1000 to 2000 pixels long and 1 pixel wide. Conversely, the optical navigation chip of the present invention inherently contains a CCD array of from 256 to 400 elements on which an image of the surface of the eye freely moves. The SCCD produces intensity maxima signals that must be further processed to determine eye motion. Conversely, the optical navigation chip of the present invention generates x and y motion data as a native function. The SCCD requires that an annular mask be mounted to the sclera of the eye by means of small projections into the epithelial layer of the eye. Conversely, the optical navigation chip of the present invention does not require that any object come into contact with the eye.

The SCCD detects eye motion for the purpose of controlling a mirror to shift the ablative laser to compensate for eye motion. The motion thus detected is not recorded for analysis of effects on saccadic eye motion. Conversely, the saccadic motion detection device of the present invention quantifies and analyzes saccadic eye motion to allow the determination of the presence of conditions that affect saccadic eye motion.

The Examiner also draws attention to the optical system in claim 1 and Smith Fig 1 (9, 13, 14, 17). The optical navigation chip of claim 1 necessitates the formation of an image of the surface of the eye. Likewise the SCCD of Smith necessitates the formation of an image of the annular mask. The formation of an image presupposes the inclusion of an optical system in both cases. However, the optical systems are fundamentally different in that each creates different images for different purposes. In Smith, the optical system must accommodate the function of other subsystems involved in the PRK procedure. Conversely, the optical system in Claim 1 of the present invention is only required to create a real image of the surface of the eye on the CCD of the optical navigation chip.

According to MPEP §2131 a " 'claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.' *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)." More importantly in

MPEP § 2131.02 '[T]the identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Thus, given the above arguments it is clear that Smith does not anticipate each and every element as set forth in the Claim 1 of the present invention and thus the 102(b) rejection has been overcome. Accordingly, the dependent Claim 13 is allowable for the same reason.

Claims 1- 4, 12, 13 and 15 as anticipated by Yee et al (US Patent No. 6,322,216)

The Examiner rejected Claims 1, 13 and 15 as anticipated by Yee et al (US Patent No. 6,322,216)("Yee"). Regarding the Claim 1 rejection, Yee describes two embodiments that are distinguished by the speed of the cameras used as elements 13h and 13v (See Yee column 3 lines 47 – 58 and column 5 lines 61 – 64). In those embodiments using ordinary cameras, Yee admits in column 3 lines 47 – 50 that the speed is insufficient to follow saccadic movements. Thus, Yee directly teaches against the present invention and by definition can not anticipate it. See MPEP 2141.02 and 2145.X. Accordingly, the dependent Claims 2- 13, as well as claim 15, are allowable for the same reason. Nonetheless, distinguishing arguments for Claim 2 is given below.

Regarding the Claim 2 rejection, Yee in Column 13 lines 38 – 44 states that the eye images from the video cameras are recorded to analog video acquisition cards and video cassette recorders. Claim 2 of the present invention makes no mention of video recordings of eye images which is an analog function but rather teaches away from Yee by stating that the optical navigation chip provides digital representations of the movement or position of the eye.

## ARGUMENT AGAINST REJECTION OF CLAIM 8 AND 14 UNDER 35 USC §103(a)

Claims 8 and 14 as made obvious by Cornsweet, et al (US Patent No. 5,410,376)

The Examiner rejected Claims 8 and 14 as made obvious by Cornsweet, et al (US Patent No. 5,410,376)("Cornsweet"). Regarding Claim 8, Cornsweet detects eye motion using a somewhat complex electromechanical tracking servo loop which also includes stepper motors; a tracking mirror; an analog error signal generating system comprised of 12 resistors, 3 amplifiers, and an analog to digital converter; a stepper driver system comprised of a CPU and two stepper controllers; and considerable software to generate stepper signals from the error signals. This tracking servo loop bears no similarity to the optical navigation chip. In the preferred embodiment of the present invention the optical navigation chip is an electronic integrated circuit known as an Optical Mouse Sensor. A specific example of such an Optical Mouse Sensor is the model ADNS-2620 made by Agilent Technologies™ of Palo Alto, CA. As such the optical navigation chip is one electronic, eight pin, dual in-line package, integrated circuit.

Additionally, the 1000 step per second step rate of the motor has only the most indirect bearing on a "sample rate" specification for the tracking servo loop. The tracking servo loop does not offer a sample rate as such. In fact, Cornsweet points out that voice coil motors could be used to replace the stepper motors (Column 5, lines 38-40) in which case there would be no step rate specification whatsoever. The accuracy of the tracking servo loop is better expressed as frequency response that would be related to the gain of the feedback loop. See column 6 lines 1 – 30. A determination of the time or amplitude accuracy of the servo loop would require in depth mathematical control system analysis of the tracking servo loop which is not provided in Cornsweet. Thus, although Cornsweet alludes to the requirement for high speed sample rates in column 1 lines 54-67, the actual frequency response or accuracy of the tracking servo loop, which would be roughly analogous to a sample rate specification, is never actually presented. Therefore Cornsweet does not in any way anticipate benefits offered by claim 8 and thus claim 8 accomplishes the measurement of saccadic eye motion for the stated subjects by use of the optical navigation chip which is a novel, non-obvious, approach to such measurement.

Regarding Claim 14, Claim 14 accomplishes the measurement of saccadic eye motion for the stated subjects, namely humans and other animals, by use of the optical navigation chip which is a novel, non-obvious, approach to such measurement.

<u>Claims 8 and 14 as made obvious by Rothberg, et al (US Patent No. 5,422,690)</u>

The Examiner rejected Claims 8 and 14 as made obvious by Rothberg, et al (US Patent No. 5,422,690)("Rothberg"). Regarding Claim 8, the response here is the same as that given for the corresponding rejection regarding Cornsweet above with the following added remarks: Rothberg in column 15 lines 21-33 points out that frequency response is the correct specification for accuracy of the tracking servo loop. Such frequency response would require mathematical control system analysis to establish. Such analysis must consider numerous factors other than step rate of the motors such as mass of the motor-mirror system, gain of the amplifiers, etc. These factors are not quantified, nor is such analysis provided. The implication that such analysis can be reduced to equating step rate to sample rate is not supported. In fact, while both Rothberg et al and Cornsweet et al admit to the requirement for high response rates they do not offer any specification of attainable sample rate at all. Therefore Claim 8 accomplishes the measurement of saccadic eye motion for the stated subjects by use of the optical navigation chip which is a novel, non-obvious, approach to such measurement.

Regarding Claim 14, Claim 14 accomplishes the measurement of saccadic eye motion for the stated subjects, namely humans and other animals, by use of the optical navigation chip which is a novel, non-obvious, approach to such measurement.